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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/617,281	07/10/2003	James E. C. Brown	RAD342	2447

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EXAMINER	
VLAHOS, SOPHIA	

ART UNIT	PAPER NUMBER
2611	

DATE MAILED: 09/20/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/617,281	BROWN, JAMES E. C.	
	Examiner	Art Unit	
	SOPHIA VLAHOS	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3, 7-12, 16-18* is/are rejected.

7)☒ Claim(s) *4-6 and 13-15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 July 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/10/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-2, 7-11, 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (U.S. 7,035,341) in view of Mohindra (U.S. 6,744, 829)

With respect to claim 1, Mohindra (341) discloses: a calibration tone generator (Fig. 4, element 40, "DSP", column 5, lines 40-42, 58-59) for generating a calibration tone for providing in-phase (I) and quadrature phase (Q) tone components (Fig. 4, outputs of mixers 64, 65 of receiving side that receive the calibration tone, column 6, lines 1-3); I and Q filters for filtering said I and Q calibration tones for issuing filtered I and Q output tones having an undesired frequency dependent I/Q phase error (see Fig. 4, elements 66 and 67, low-pass filters (see column 7, lines 10-12), and 72 and 74 all-pass networks – see column 9, lines 9-18), at least one of the I and Q filters having an adjustable characteristic (see column 9, lines 10-12, 34-36 the "adjustable all-pass networks"); adjusting said adjustable characteristic for reducing said frequency dependent I/Q phase error (Fig. 4, DSP, element 73, "Adjust", and elements 72 and 74 the "all-pass networks", see column 8, lines 1-9, lines 17-18 $\Delta\Phi_{BB}$ the frequency

dependent baseband band IQ phase error (column 8, equation (4), column 9, lines 1-13, lines 37-39).

Mohindra (341) does not teach: a correlator for cross correlating said I and Q output tones for providing a cross correlation feedback signal, said correlation feedback signal used for adjusting said adjustable characteristic for reducing said frequency dependent I/Q phase error.

In the same field of endeavor, Mohindra (829) discloses: a correlator for cross correlating said I and Q output tones (see Fig. 3, cross-correlation by mixer of $V_I(t)$ and $V_Q(t)$, column 3 lines 17-20, specifically lines 42-51 and equation on line 45 right hand side). At the time of the invention, it would have been obvious to a person of ordinary skill in that [Eqn. 4] of Mohindra (341) see that right side of the equation is $K_3\sin(\Delta\Phi_{BB})$ is equal to the right hand side of the equation on line 45 of column 3 of Mohindra (829) and therefore it would have obvious to a person of ordinary skill in the art that the $I_{sin}(t)Q_{cos}(t)-I_{cos}(t)Q_{sin}(t)$ (equation 4 of column 8 of 7,035,341) performed by DSP 40 of Mohindra (341) can be replaced by the computation of $a\sin(\theta)[n_I(t)*n_I(t)]$ of the equation on line 45 of column 3 of 6,744,829 (column 3, see lines 14-50) since computing the latter equation is independent of a gain and simple to implement (column 3, lines 42-44 and see Fig. 3). Incorporating the teaching of Mohindra (829) in the system of Mohindra (341) results into using a correlation feedback signal (equivalent to the computed $I_{sin}(t)Q_{cos}(t)-I_{cos}(t)Q_{sin}(t)$ of Mohindra (341) and column 9, lines 38-40) for adjusting said adjustable characteristic for reducing said frequency dependent I/Q phase error.

With respect to claim 2, all of the limitations of claim 2, are analyzed above in claim 1 and Mohindra (341) discloses: said correlation feedback signal adjusts said adjustable characteristic for minimizing a phase difference between said I output tone and said Q output tone (column 9, lines 1-3).

With respect to claim 7, all of the limitations of claim 1, are analyzed above in claim 1, and Mohindra (341) discloses: wherein: the I and Q filters include I and Q allpass filters for providing said I and Q output tones (see Fig. 4, adjustable all-pass networks 72, 74, column 9, lines 9-13, where clearly the calibration tones pass through these all-pass filter) ; and said adjustable characteristic is a phase delay of at least one of said I and Q allpass filters (see column 9, lines 20-27, 37-39 adjusting the values of R1 and C1 results into phase delay (shift)).

With respect to claim 8, all of the limitations of claim 8, are analyzed above in claim 7, except for: said phase delay is adjusted by frequency scaling at least one pole by a certain factor and frequency scaling at least one zero by an inverse of said certain factor in said at least one of said I and Q allpass filters. However, at the time of the invention, the above would have been obvious to a person of ordinary skill in the art that in a first order all-pass filters a pole is located in P a the zero is located in 1/P, therefore, scaling at least one pole by a certain factor and frequency scaling at least one zero by an inverse of said certain factor, would have to take place so that the phase shift of the all-pass networks is changed as taught by Mohindra (column 9, lines 18-23).

With respect to claim 9, a frequency downconverter including a local oscillator for providing a complex LO signal and I and Q frequency downconverters using said LO signal for downconverting an input signal having a carrier frequency to I and Q signal components (see Fig. 4, combination of elements LO, filter and PLL (approximately in the center of Fig. 4), mixers 64, 65 of receiving side of transceiver, column 6, lines 1-3); and wherein: the calibration tone generator issues a calibration signal as said input signal having a certain frequency offset from said carrier frequency for providing said I and Q calibration tone components in place of said I and Q signal components (see column 5, lines 67 and column 6, lines 1).

With respect to claims 10-11, 16-18 these analyzed similarly to claims 1-2, 7-9 above.

3. Claims 3, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mohindra (U.S. 7,035,341) in view of Mohindra (U.S. 6,744, 829) as applied to claims 1 and 10, and in view of Armstrong et. al., (U.S. 5,559,828).

With respect to claim 3, all of the limitations of claim 3 are analyzed above in claim 1, except for: said calibration tone has a frequency near to a cutoff frequency for said I and Q filters. In the same field of endeavor, Armstrong et. al., disclose: said calibration tone has a frequency near to a cutoff frequency for said I and Q filters (column 9, lines 15-18). At the time the invention, it would have been obvious to a

person of ordinary skill in the art to have the calibration tone have a frequency near to a cutoff frequency for said I and Q filters so that in the receiver filters best match the transmitted signals.

Allowable Subject Matter

4. Claims 4-6, 13-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Warner (U.S. 6,940,916) discloses a system pre-compensating and post-compensating a modulator/demodulator to correct for frequency dependent I/Q imbalance.

Roger A. Green et. al., "An optimized multi-tone calibration signal for quadrature receiver communications system" discloses real-time adjustable filter based frequency dependent I/Q phase imbalance.

Muschallik et. al. (U.S. 2004/0087279) discloses: a multitone receiver/transmitter system performing I/Q calibration.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is 571 272 5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SV
9/13/2006

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER